NOAA REPORT

Vol. VIII, No. 4 www.publicaffairs.noaa.gov/nr April 1999

Remembering Xenia. It was the worst tornado outbreak in U.S. history, with 148 twisters touching down in 13 states. When it was over 16 hours later, 330 people were dead and 5,484 were injured in a damage path covering more than 2,500 miles.

On March 31, the National Weather Service marked the 35th anniversary of the April 3-4,1974, super tornado outbreak with a special program in Xenia, Ohio, site of the most damaging—and deadly—twister.

News Briefs

"We want the public to be aware that deadly storms such as the 1974 outbreak can and will happen again, and we want people to be prepared," said Kenneth Haydu, meteorologist-in-charge of the Weather Service office in Wilmington, Ohio, host of the Xenia event. (**See page 4 for more.**)

Prahl To Direct Marine Centers. President Clinton has nominated Captain Nicholas A. Prahl to head NOAA's Atlantic and Pacific Marine Centers. Prahl will receive the rank of rear admiral, lower half, when he is confirmed by the Senate and officially assumes his new duties. He relieves Rear Adm. John C. Albright, who retires May 1. Prahl most recently was acting director of the National Ocean Service's Office of the Coast Survey, where he managed the nation's nautical charting program.

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Weather Knows No Political Boundaries

Hurricane Team Tours Caribbean, Central America

It was a hurricane awareness tour with extraordinary highlights that took NOAA hurricane experts to Central America and the Caribbean following the devastation caused by hurricanes Georges and Mitch.

Hurricane specialists from the National Weather Service and Aircraft Operations Center made up the team, sponsored by the United Nations World Meteorological Organization. Their mission: meet with emergency managers and meteorologists in Nicaragua, Hondu-

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Cuban schoolchildren flock to NOAA hurricane safety exhibit at Havana Airport.

Workforce Survey Results Are In

Of the nearly 10,000 NOAA employees who participated in the recently completed workforce survey, 64 percent said they were satisfied with employee involvement, one of fifteen workforce "dimensions" representative of healthy companies. Teamwork came in a close second. For a complete report on the results, including dimensions that did not fare so well, see the home page of the NOAA Office of Diversity at www.rdc.noaa.gov/diversity.html.

Administrator Baker Named Zucker Fellow

NOAA Administrator D. James Baker has been named the 1999 Benjamin Zucker Environmental Fellow by Yale College. Established in 1990, the fellowship brings a major scientist, public policy figure or author in the field of environmental studies to the Yale campus each year to help inspire students to embark on environmental careers.

In a March 29 visit to Yale, Baker lectured undergraduates on global climate change and later spoke to a broader university audience on sustainable development, focusing on the concepts of environmental sustainability, recent attempts to develop indicators of sustainability, and recommendations from the President's Council on Sustainable Development on climate change issues.

"With the ending of the Cold War it is becoming clear that global security depends not just on military strength," Baker said, "but also on economic prosperity, the conservation of natural resources, environmental protection and social equity. Future conflicts are just as likely to arise from failures in development as from failures in diplomacy.

"The new paradigm for the 21st century is no longer military security, but rather sustainable development–development that meets the needs of the present without compromising the ability of future generations to meet their own needs," Baker said.

The day ended with a meeting with students at a Master's Tea at Calhoun College to discuss environmental issues, with much of the discussion focusing on salmon and fisheries questions raised by the students.

The Yale visit also provided Baker with the opportunity to visit the National Marine Fisheries Service Laboratory in Milford, Conn., where he held met with laboratory staff, followed by a tour of the facility and discussion of research issues, led by laboratory director Anthony Calabrese.

Administrator Baker lectures at Yale.

April Is Tsunami Awareness Month

In April, NOAA teams up with the states of Hawaii, Washington, Oregon and California in a month of activities designed to warn the public about the potential risk of tsunamis.

"We are lucky that Hawaii hasn't had a major tsunami strike all the islands since 1964," said Chip McCreery, director of the Pacific Tsunami Warning Center in Ewa Beach, Hawaii. "But at the same time, because it was so long ago, we may have forgotten or may never have learned what are the right things to do to protect ourselves and our families."

Hawaii isn't the only state threatened by the great sea waves that can be caused by underwater earthquakes and other geologic forces.

All Pacific States Vulnerable

"The states of Alaska, Washington, Oregon and California are also vulnerable to the threat of tsunamis," said Richard Hagemeyer, director of the National Weather Service Pacific Region in Honolulu. "We are sharing Hawaii's experiences with experts in other states to produce inundation and evacuation maps and help educate the public. The National Tsunami Hazard Mitigation Program is receiving $2.3 million a year to conduct these programs, which include deploying deep ocean buoy monitors and expanding seismic warning networks," Hagemeyer said.

Warning Centers Established

In 1948, the predecessor of the Pacific Tsunami Warning Center was established, followed in 1967 by the West Coast/Alaska Tsunami Warning Center in Palmer, Alaska,

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Hurricane Team Visits Cuba

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ras, the Dominican Republic, Puerto Rico and Cuba—countries hard hit last year by powerful hurricanes—to promote outreach, public education and teamwork. This year's tour was the U.N. team's first visit to Cuba.

While NOAA meteorologists met with their counterparts in each country March 15-20, NOAA's Aircraft Operations Center personnel showcased the WP-3 Orion hurricane research airplane, demonstrating the aircraft's unique hurricane data gathering and research technology to local officials and citizens alike. Famous for flying into hurricanes, including Mitch, the four-engine turboprop is piloted by NOAA Corps officers based at MacDill Air Force Base in Tampa, Fla.

At each stop, school children toured the aircraft, often volunteering their unique insights into the impact of these devastating storms on ordinary people. One crew member noted that the children's questions were like a "window into the soul, a mix of fear and optimism." Some children described their experiences in the path of a major hurricane and, almost in the same breath, asked what they'd have to study to be "hurricane hunters."

Honduran citizens queue up to inspect the American plane that flies into hurricanes.

"All twenty-five countries in the WMO's regional association are interdependent," notes Jerry Jarrell, team leader and director of the National Weather Service's National Hurricane Center. "As hurricanes approach the United States, we benefit from the observational networks and forecast efforts of these countries. They in turn receive our hurricane warnings.

"By demonstrating international teamwork, we assist host country meteorologists in maintaining a strong base of support within their own governments and help them demonstrate the value of their forecasts to vulnerable communities. Collectively, we can help reduce the losses caused by powerful tropical events," Jarrell added.

NOAA teams have conducted three hurricane tours in the region since 1990. Visiting five to six countries each year, the team focuses public awareness on the threat posed by hurricanes. But the trips also help exchange information on the international capabilities, procedures and technology used to forecast hurricanes.

"From a world perspective, weather knows no boundaries. The weather they have today reaches our shores a day or two later," Jarrell said.

The National Hurricane Center will conduct three more hurricane awareness tours this season. In April, the hurricane experts travel to English-speaking Caribbean countries

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The American hurricane awareness team makes its first visit to Cuba.

Focus On...

The Worst Tornado Outbreak in U.S. History

Xenia, Ohio. History and technology converged March 31 in Xenia, Ohio--ground zero for the nation's worst tornado outbreak--as NOAA officials joined the community in remembering when 148 twisters struck their state and twelve others on April 3-4, 1974.

Twenty-five years ago, National Weather Service forecasters could see only green blobs on their radar scopes and relied on visual confirmation to issue tornado warnings. Today's forecasters, thanks to a $4.5 billion weather service modernization effort, view evolving storms in graphic detail and issue warnings, often before tornados even form.

"Deadly storms such as the 1974 super outbreak can and will happen again," said Ken Haydu, meteorologist in charge of the Weather Service's forecast office in Wilming- ton, Ohio, and host of the public program in Xenia. "On average, across the country, the National Weather Service has doubled its warning lead times for tornados. But these warnings mean nothing if people don't receive them or don't take appropriate action after receiving them," Haydu said.

"The people who experienced the super outbreak have an important story about tornado awareness and preparedness to pass on to later generations," the meteorologist continued, "and today's forecasters have an equally important story to tell about the advanced capabilities they now have at their fingertips to warn the public of severe weather."

During the 1974 outbreak, tornadoes caused a damage path of more than 2,500 miles leaving 330 dead and 5,484 injured. In less than 24 hours, twisters ran the gamut from 0 to 5 on the Fujita Scale, with some tornadoes traveling more than 100 miles. One twister was five miles wide and at one point, fifteen tornadoes were on the ground at the same time. One twister even crossed over into Canada from Michigan and back again. In all, thirteen states were struck by twisters: Alabama, Georgia, Illinois, Indiana, Kentucky, Michigan, Mississippi, North Carolina, Ohio, South Carolina, Tennessee, Virginia and West Virginia.

John Forsing, director of the Weather Service's Eastern Region, worked the storm as a forecaster at the NWS office in Louisville. "The top floor of the terminal building offered an unobstructed view of the storm," Forsing recounted. "As the lowered cloud base moved overhead, we first observed the funnel cloud forming and were able to even see small scale circulations within the descending vortex. Suddenly, an instrument shelter, which was bolted to a rooftop deck, collapsed on its side in front of our window. An I-beam, ripped from the rooftop and thrown onto a car in the adjacent parking lot, marked the beginning of a trail of damage affecting 900 homes and causing millions of dollars of property loss in the Louisville area."

—Robert Chartuk

(Pictured left to right) John Forsing, Director, NWS Eastern Region, Dr. Lee Esprit, President of the Xenia City Council, and John Saraga, Mayor of Xenia, review Ohio's modern tornado response plan.

Forecaster Spots Tornado on Ground

A tornado touches down in Bridgetown, just west of Cincinnati, causing three deaths and 210 injuries.

Louisville, Kentucky. When forecaster intern Russell Conger reported for duty at the Weather Service Office in Louisville on April 3, 1974, he didn't know he'd get a close up look at a tornado minutes later—or that he was seeing the start of one of the worst tornado outbreaks in U.S. history.

"Severe weather was beginning to break out near Louisville as I reported to work for the 4 to midnight shift," Conger said recently, "but not to the extent that it occurred.

"Our MIC was at my desk talking to a local radio station," Conger said, "when the electronics technician stuck his head out of the radar room and yelled there was a tornado about 2½ miles away. Ignoring our own safety warnings, we all ran to the windows to look.

"There were a lot of low-hanging clouds, but no rotation. The low clouds seemed to be converging and then the anemometer on the runway complex began to pick up—first a steady 40 knots, then 50, then 60, then 70. Finally, rocks started flying off the roof and hailstones started hitting the window. We all ran for cover."

The forecast crew emerged seconds later to see the tornado over the airport parking lot. "Everything happened so fast, we didn't really have time to be scared," Conger said. "When we looked out the window again, the tornado was right there. It had picked up enough debris to be visible and had a large circulation pattern. Obviously this was the beginning of the Louisville tornado."

Fortunately, for Louisville residents, Conger and his workmates were able to issue a tornado warning 37 minutes before the tornado hit.

By the time the tornado dissipated, it left a damage path 660 feet wide and 22 miles long—covering that distance in 21 minutes. More than 900 homes had been damaged beyond repair.

—Patrick J. Slattery

The Kentucky tornado left a damage path 660 feet wide and 22 miles long, covering the distance in 21 minutes.

National Geographic Releases Natural Hazards Lesson Plan With NOAA's Help

Science teachers across the country will begin receiving a lesson plan this month on natural hazards reduction, thanks to funding from NOAA's Coastal Services Center in Charleston, S.C., and the scientific expertise of NOAA research meteorologist Joseph Golden, who served as technical advisor on the project.

The lesson plan, based on the map of natural hazards in North America that appeared this past July in *National Geographic Magazine*, describes natural hazards ranging from hurricanes to tsunamis, and where these hazards occur. It also includes several references to NOAA hazards information and related Web sites.

"The map and text teach kids about natural hazards that might affect their region and the steps they can take to safeguard their homes and families," Golden said. "In addition to safety tips, the lesson plan also includes role playing exercises in which the students learn how to make important safety decisions, such as building homes in hazard-prone areas," he said.

"It's one of the most important projects in my 35-year NOAA career," Golden added. "It achieves the original goal of getting these hazards maps to as many school children as possible because parents often learn about weather safety from what their kids bring home from school."

Research meteorologist Joseph Golden.

Miller Freeman Resumes Operations After Major Repairs

Miller Freeman, NOAA's largest fisheries research ship, has completed $7.5-million in repairs and improvements and has resumed operations in the North Pacific Ocean and Bering Sea.

The work by Alaska Ship and Drydock in Ketchikan, Alaska, begun in September 1998, included an overhaul of the ship's main engine and generators and replacement of its reduction gear, shaft and controllable pitch propeller, modifications in the ship's aft fishing deck, preservation and painting of the ship's hull and deck, installation of a new rescue boat and davit, and modifications and upgrades of many of the ship's mechanical, hydraulic and electrical systems.

This is the first time NOAA has contracted with an Alaskan shipyard for major repair work on a NOAA ship. The *Miller Freeman* repairs were a collaborative effort by the primary users of the vessel–National Marine Fisheries Service scientists–and engineers with the Office of NOAA Corps Operations, which manages and operates the ship.

Fisheries research ship Miller Freeman has completed major repairs and resumed operations.

The 215-foot, 1,920-ton *Miller Freeman* is the only American ship in the north Pacific with the hydroacoustic, trawling and oceanographic capabilities to conduct NOAA's critical research and stock assessment surveys. The fisheries data it collects–primarily on pollock and groundfish–enable the Pacific Northwest Fisheries Management Council to manage and set accurate quotas for the region's multi-billion dollar fishing industry.

—Jeanne Kouhestani

Pictured left to right:(front row) Elizabeth Jones, Gretchen Imahori, David Zezula, Michael Ellis, Angie Venturato, Paulene Roberts; (back row) Kevin Slover, Nancy Ash, Bradley Fritzler, G. Mark Miller, A. Jesse Stark, Daniel Karlson, Marc Moser and training officer Capt. Craig Nelson.

New NOAA Corps Officers Report

The first class of recruits in four years graduated March 25 from the intensive three-month NOAA basic officer training course at the U.S. Merchant Marine Academy in Kings Point, N.Y. The new NOAA ensigns have already reported to their first ship and aircraft assignments. Welcome aboard!

Hurricane Tour Continues

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with the U.S. Air Force Reserve 53rd Weather Reconnaissance Squadron from Keeler Air Force Base in Biloxi, Miss., followed by a tour of east coast U.S. cities and Canada. In early June, the team takes their hurricane safety messages to cities along the U.S Gulf coast in NOAA's Gulfstream-IV high altitude jet.

—Frank Lepore

U.S. team members and officials meet with their Cuban counterparts at Havana Airport. Pictured (left to right): Capt. Donald D. Winter, Director of NOAA's Aircraft Operations Center; Michael Kozak, Principal Officer, U.S. Interests Section, Havana; John Boardman, Deputy Principal Officer; Fabio Fajardo Moros, Vice Minister of Cuban Environmental Sciences; Jerry Jarrell, Director of NOAA's National Hurricane Center; and Tomas Gutierrez, Chief, Meteorology, Havana.

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***Oregon II* Rescues Three From Stormy Seas**. Through a combination of sharp eyes, perseverance and sheer luck, two men and a woman were plucked from stormy seas 25 miles off Cape Canaveral by crew members of the NOAA fisheries research ship *Oregon II* Feb. 28.

Oregon II was returning to its home port of Pascagoula, Miss., when the crew spotted the trio clinging to the hull of their 25-foot fishing boat, which had capsized in six- to eight-foot seas. Unable to send a distress signal, the three mariners were in the water for about five hours and might have perished if the ship hadn't passed nearby and seen them.

Lt. Cmdr. Mike Gallagher, lead fisherman Dave Nelson and fisherman Gerald Koonce of Oregon II went to their rescue in a small rubber boat in rough seas and high winds, pulled the three out of the water and returned them safely to the ship. Suffering only from mild hypothermia and minor injuries, the lucky mariners, Dale Woodburn and Richard McKinnon of Roseland, Fla., and Stacey Marinelli of Sebastian, Fla., were put aboard a Coast Guard cutter approximately an hour later.

News Briefs

New Marine Sanctuary Managers. Carol Bernthal is the new manager of the Olympic Coast National Marine Sanctuary, 3,310 square miles of marine habitat off the coast of Washington. G.P. Schmahl is the new manager of the Flower Garden Banks National Marine Sanctuary, a pair of underwater "gardens" 100 miles off the coast of Texas and Louisiana.

President Clinton Promises Sea Grant Aid to Cental American Hurricane Survivors

Following the devastation caused by Hurricane Mitch, President Clinton has offered the assistance of the National Sea Grant College Program to the people of Honduras and Nicaragua.

Speaking in Honduras March 8, the President said, "NOAA's university-based Sea Grant program is uniquely positioned to help the government and universities of Honduras establish a national education program to improve citizen decision-making during and after the reconstruction process."

Sea Grant released $95,000 in initial funding for the relief program.

This spring, a team of experts from the University of Puerto Rico Sea Grant program will meet with local officials and community leaders to assess the educational and technical support needs of hurricane-ravaged inhabitants.

Following this initial visit, team members will hold nine workshops on coastal infrastructure development, watershed management and sustainable eco-tourism for an estimated 300 local leaders, resource managers, municipal administrators, academicians, news media, fishermen and other hurricane impacted residents.

Little Time to React to Tsunamis

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to warn citizens of the U.S. westcoast and British Columbia. In both centers, geophysicists work around the clock monitoring earthquakes and disseminating information.

"We have systems in place now that allow us to provide the public adequate warning time—from a minimum of three hours to more than 14 hours—for a distant tsunami, such as those that occurred in 1946, 1952, 1957, 1960 and 1964," said McCreery.

"However, if a tsunami is caused by a nearby earthquake as in 1975, there is very little time available. Our residents and visitors need to know that if the ground shakes so violently that it is difficult to stand, and they are near the sea, they should get to high elevations or inland immediately, without waiting for an official warning," McCreery warns.

"Use whatever means are readily available and practicable," McCreery advises, "whether that means walking, running, bicycling, driving or even taking an elevator to a higher floor. A tsunami could strike within minutes or even less. Everyone located in a potential inundation zone—schools, work places, all public facilities and families—should have a tsunami evacuation plan and know what to do."

—Delores Clark

NOAA Report is a monthly publication for and about NOAA employees from the Office of Public and Constituent Affairs, Washington, D.C.
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